

Computer Interpretation of Quantitative DNA Evidence

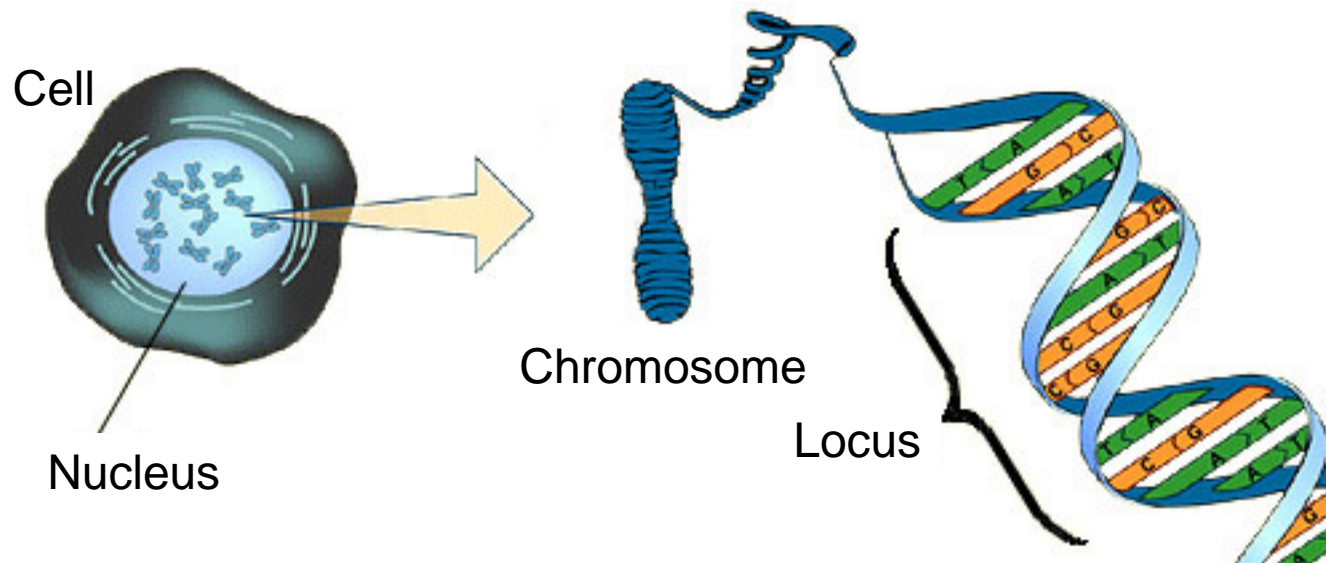
Commonwealth of Pennsylvania v. Lafon Ellis
December, 2019
Pittsburgh, PA

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Cybergenetics, Pittsburgh, PA



Cybergenetics

DNA biology



Short tandem repeat



23 volumes in
cell's
DNA encyclopedia

DNA locus paragraph

Take me out to the ball game

take me out with the crowd
buy me some peanuts and Cracker Jack
I don't care if I never get back

let me

root root root root root root root root root root

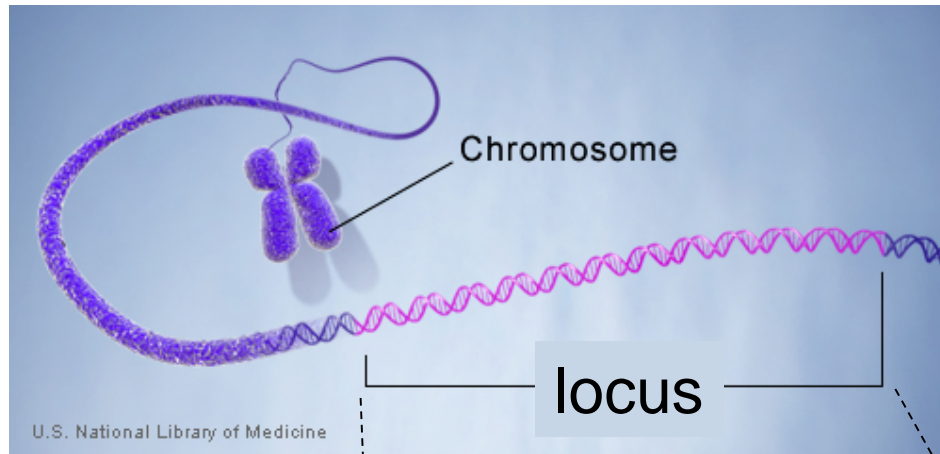
for the home team,

if they don't win, it's a shame for it's one, two,
three strikes, you're out

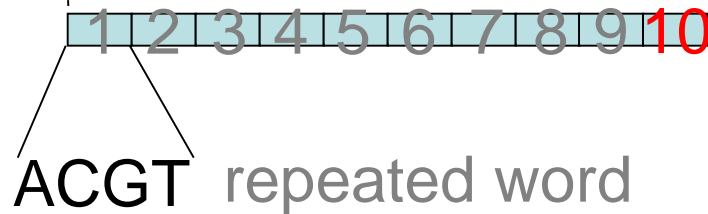
at the old ball game

"root" repeated 10 times, so
allele length is 10 repeats

DNA genotype



mother
allele



father
allele



A genetic locus has two DNA sentences, one from each parent.

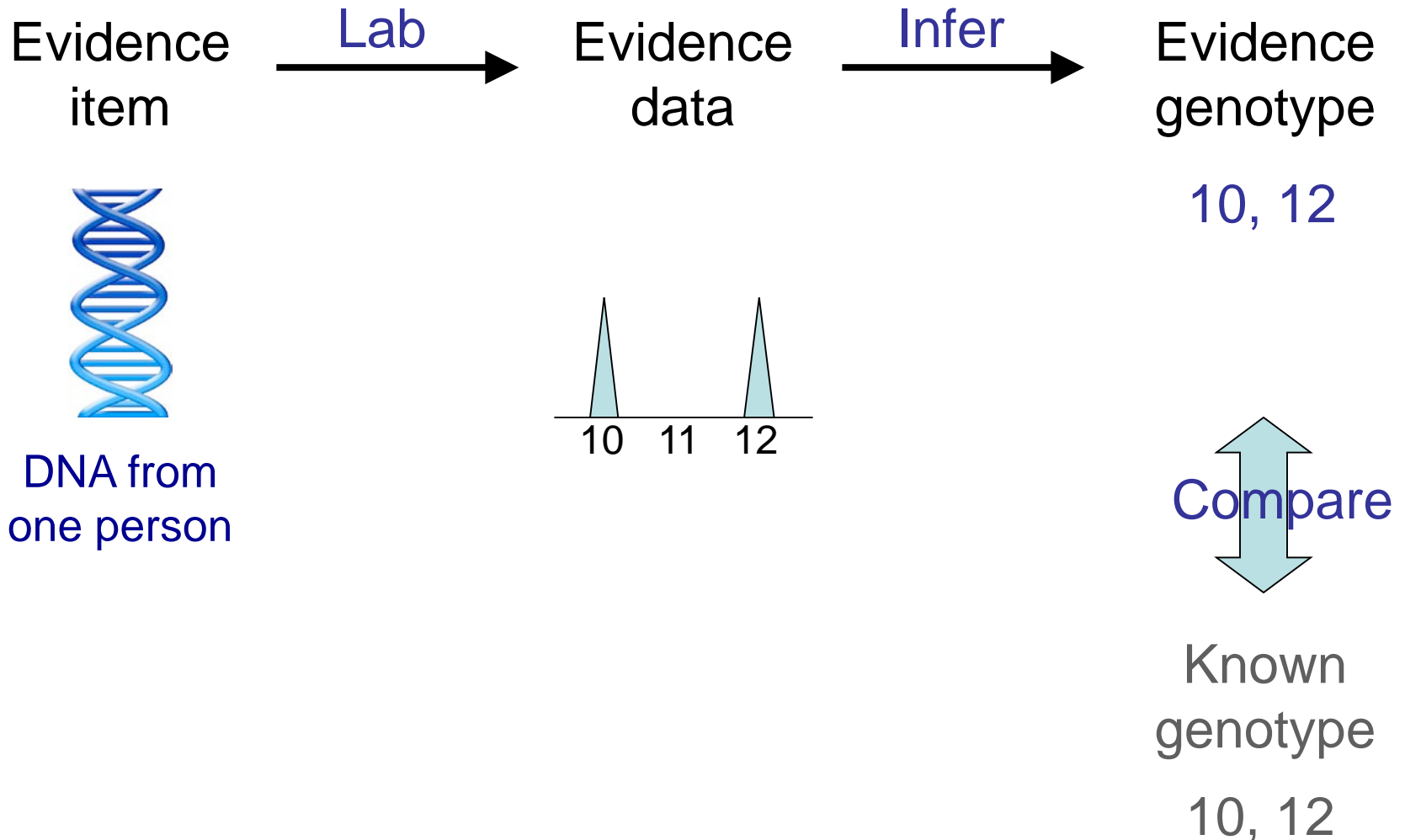
An **allele** is the number of repeated words.

A **genotype** at a locus is a pair of alleles.

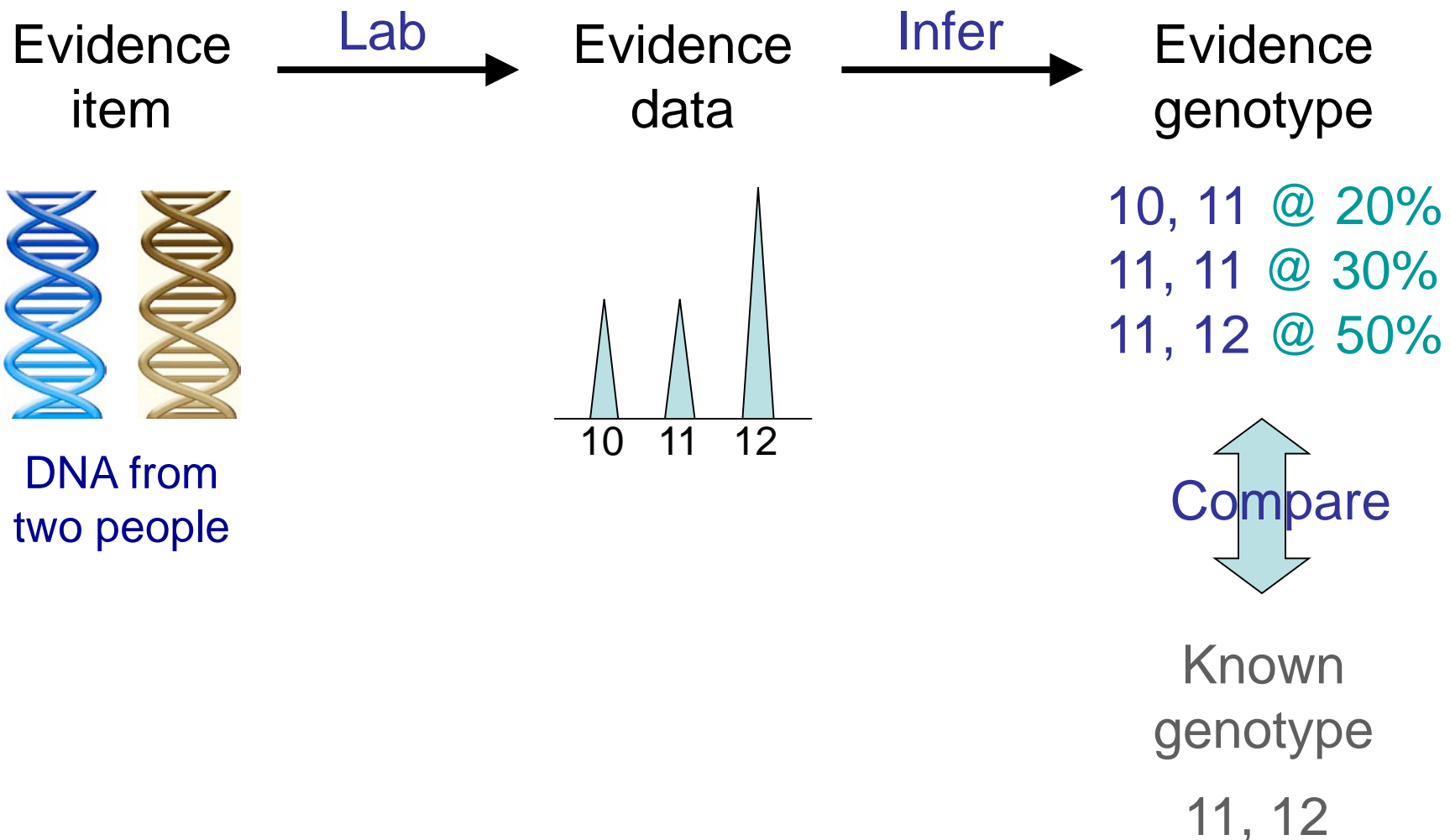
10, 12

Many alleles allow for many many allele pairs. A person's genotype is relatively unique.

DNA evidence interpretation

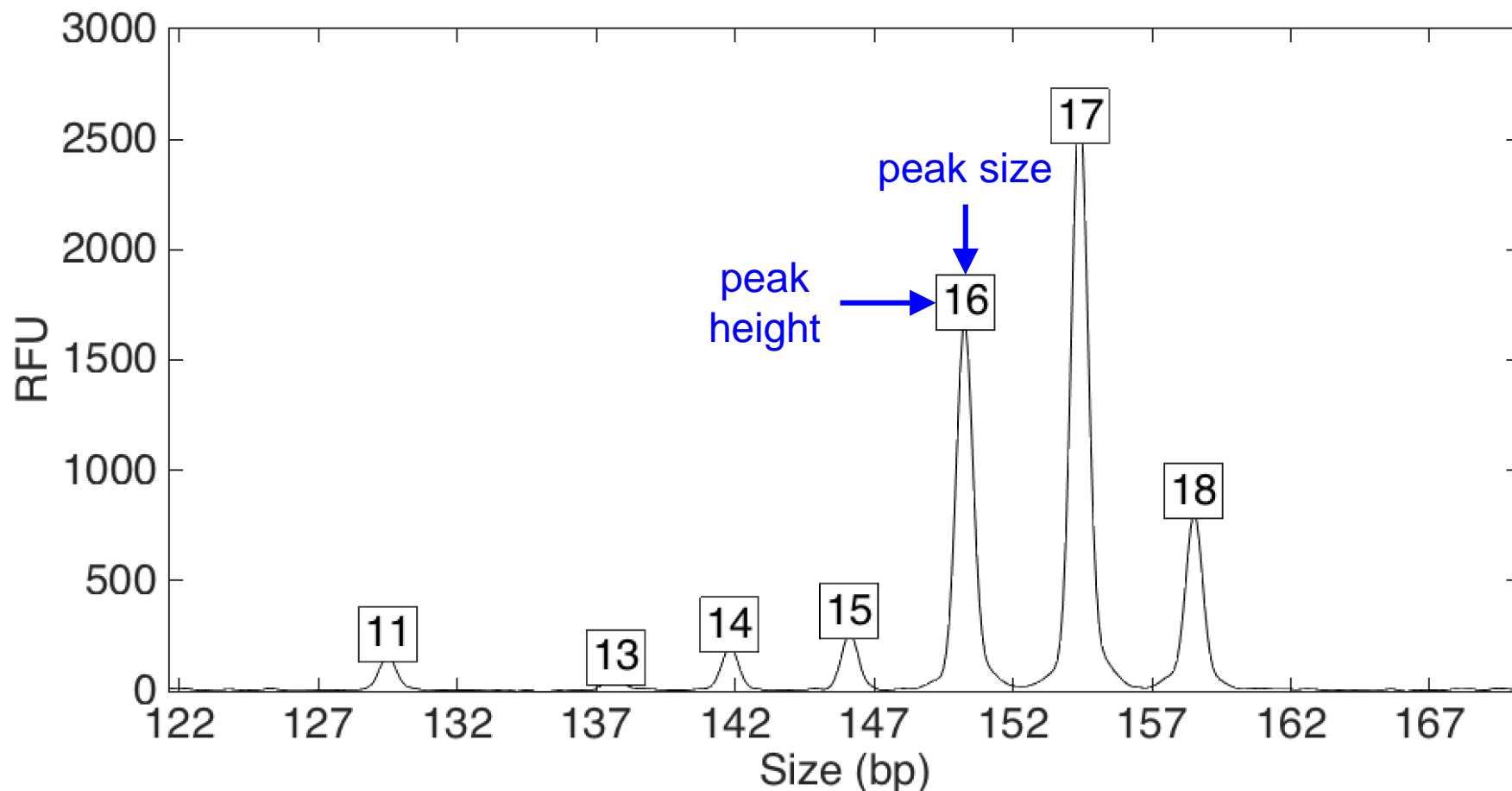


DNA mixture interpretation



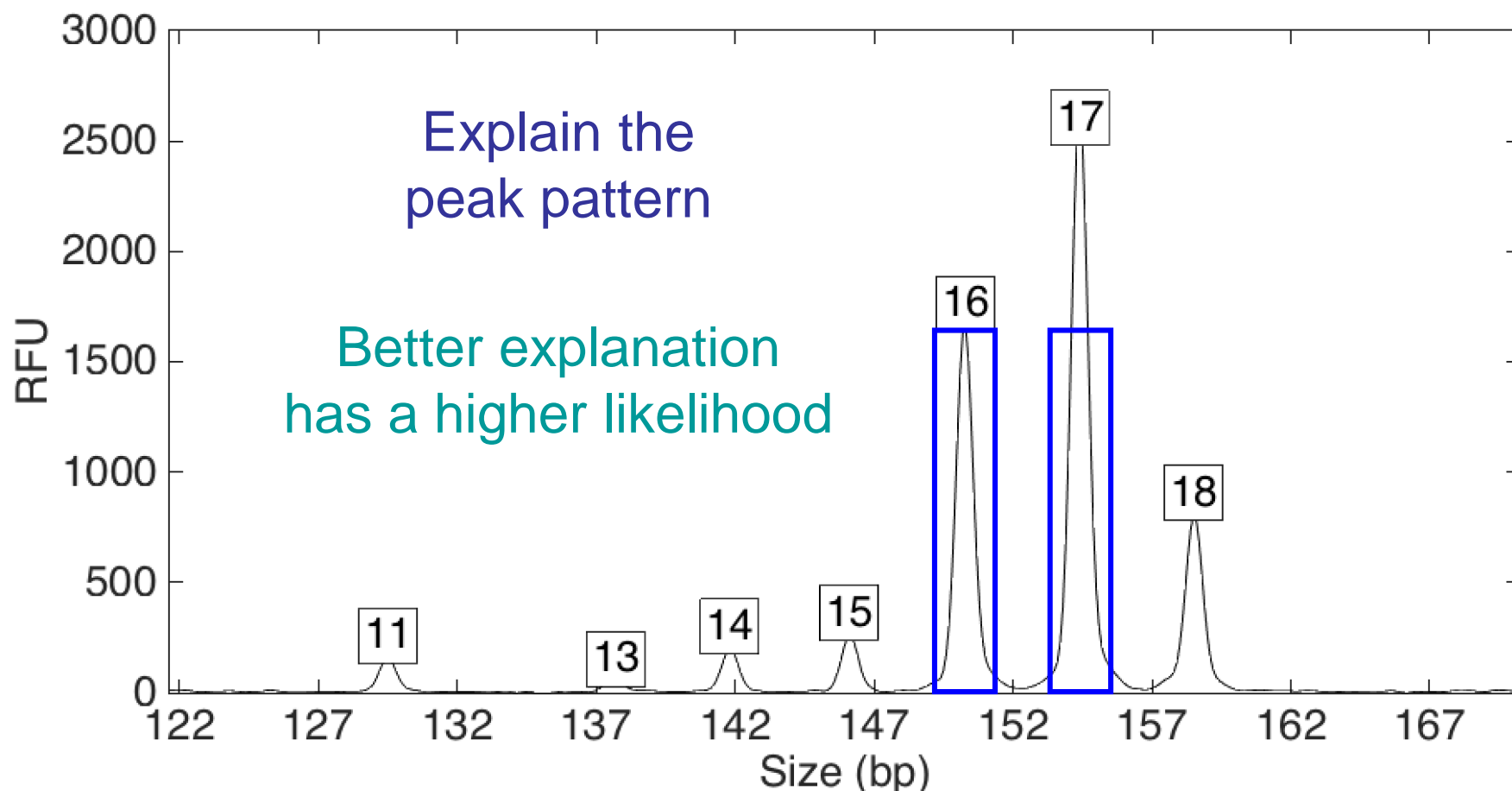
Computers can use all the data

Quantitative peak heights at locus vWA



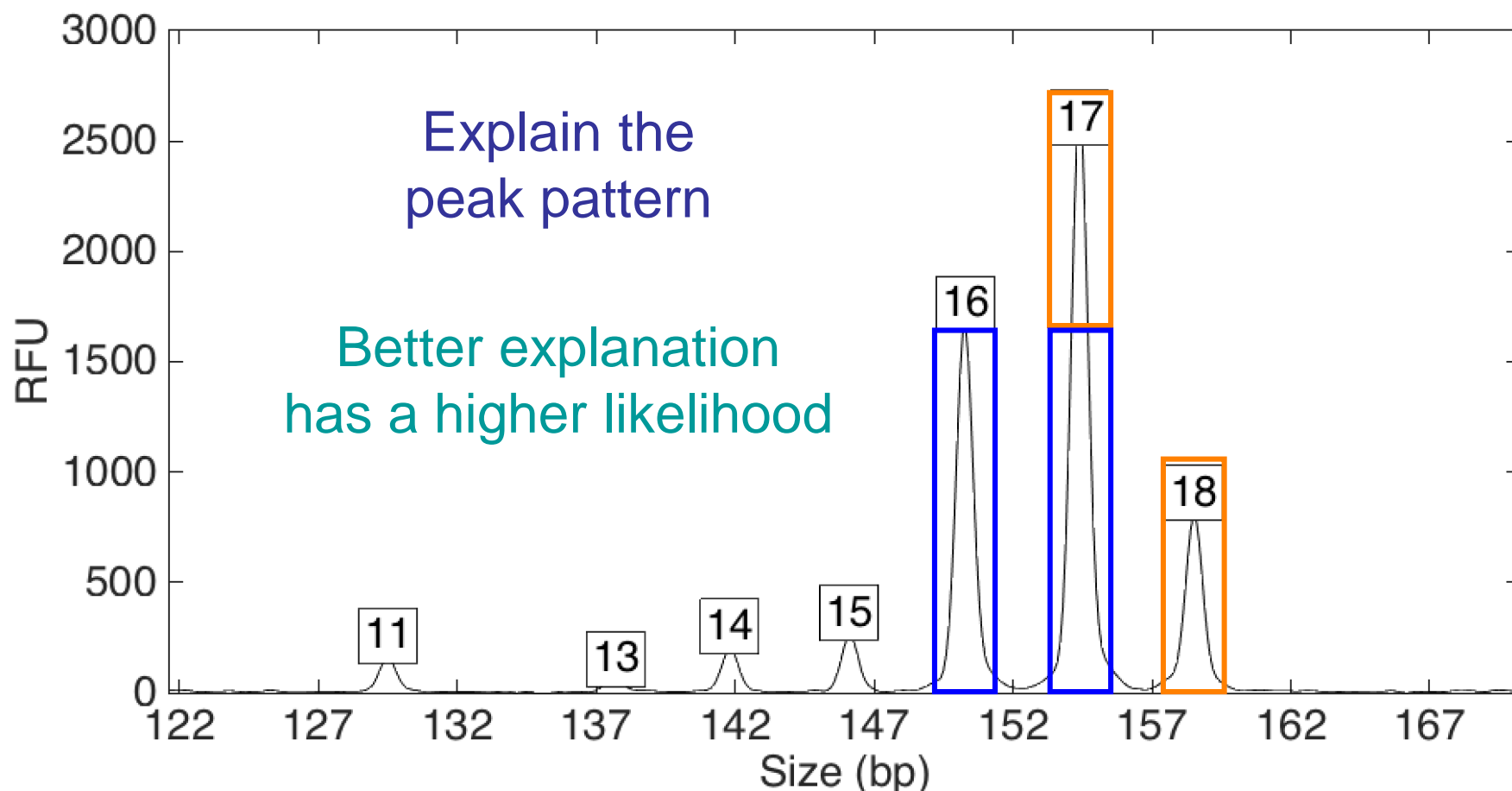
How the computer thinks

Consider every possible genotype solution



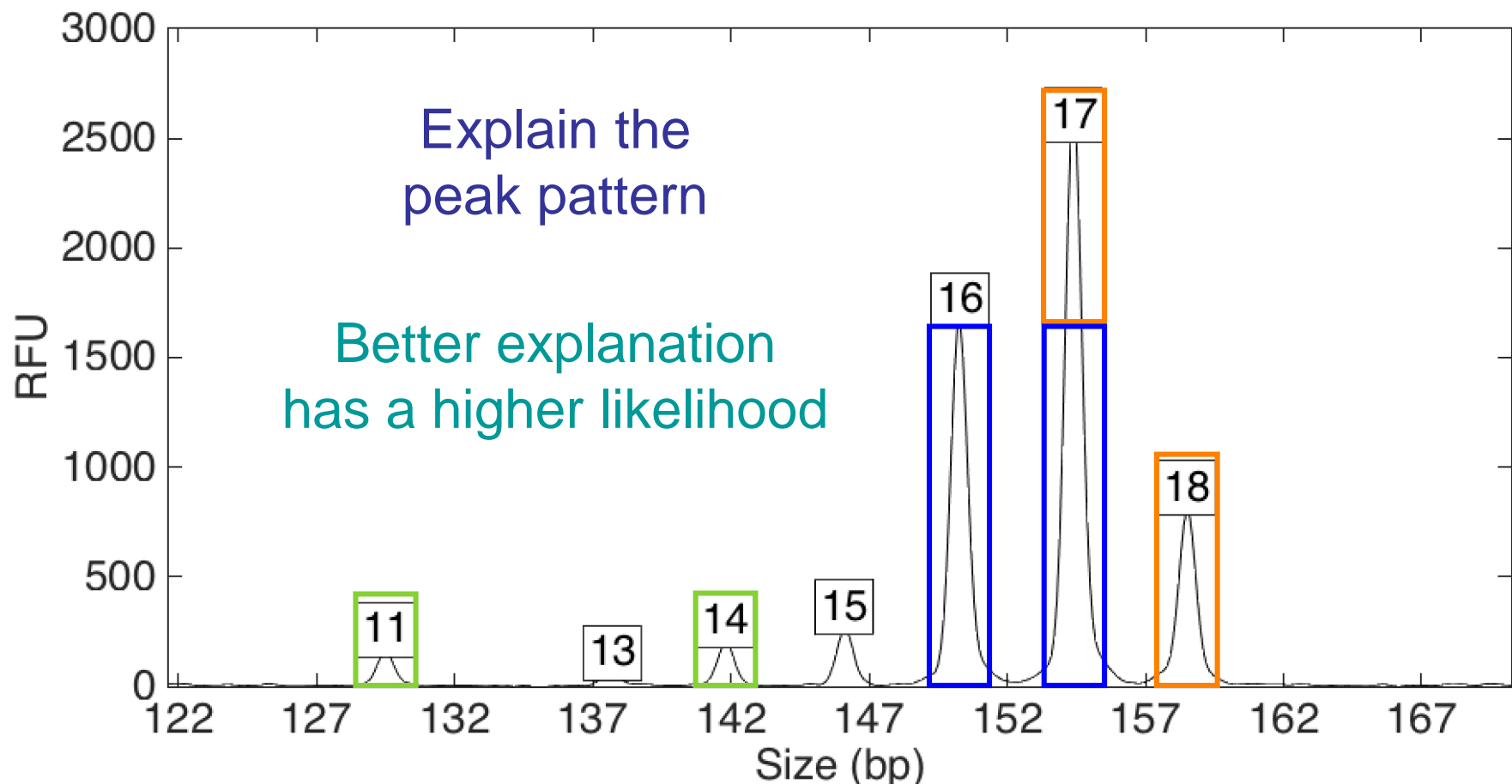
How the computer thinks

Consider every possible genotype solution



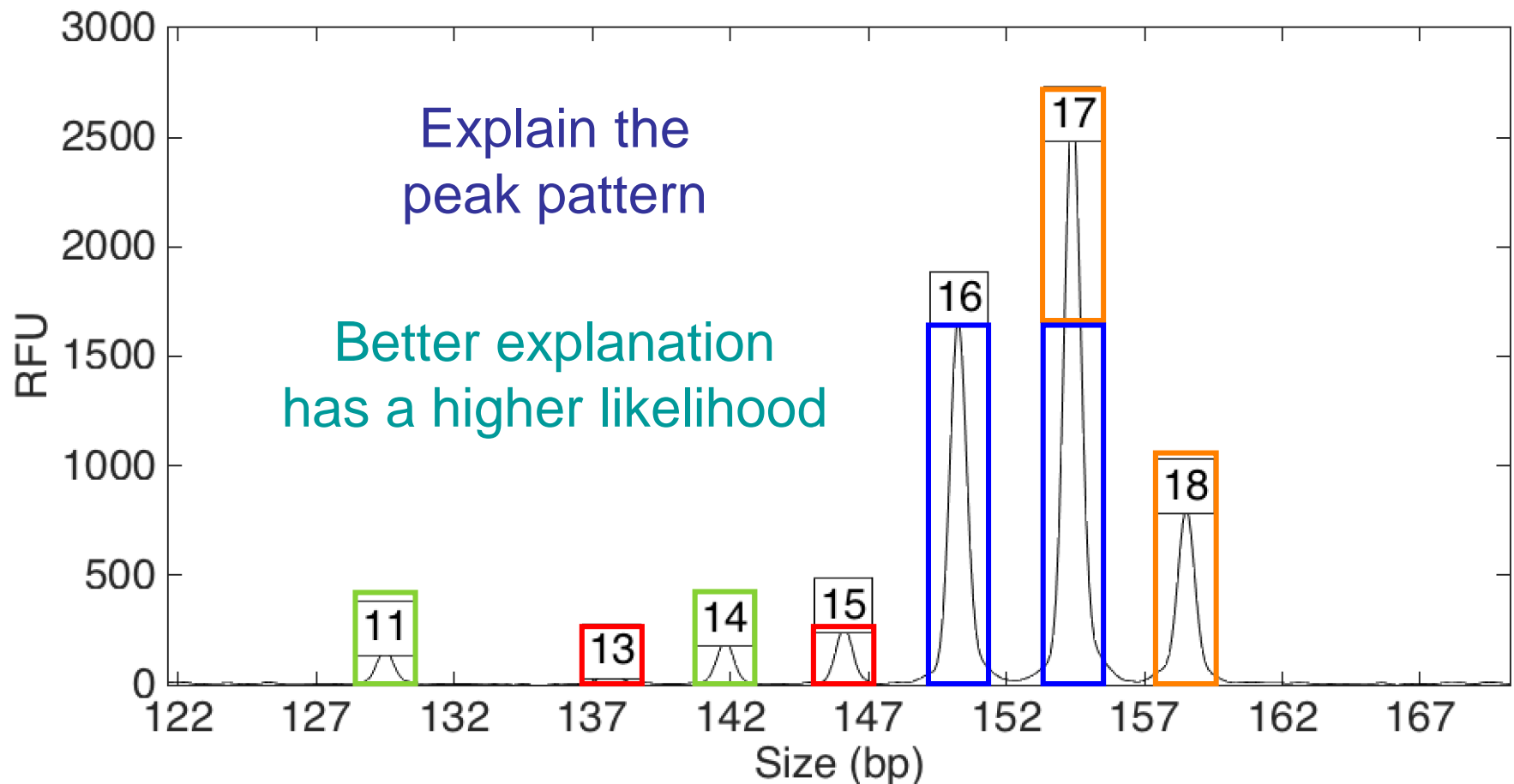
How the computer thinks

Consider every possible genotype solution



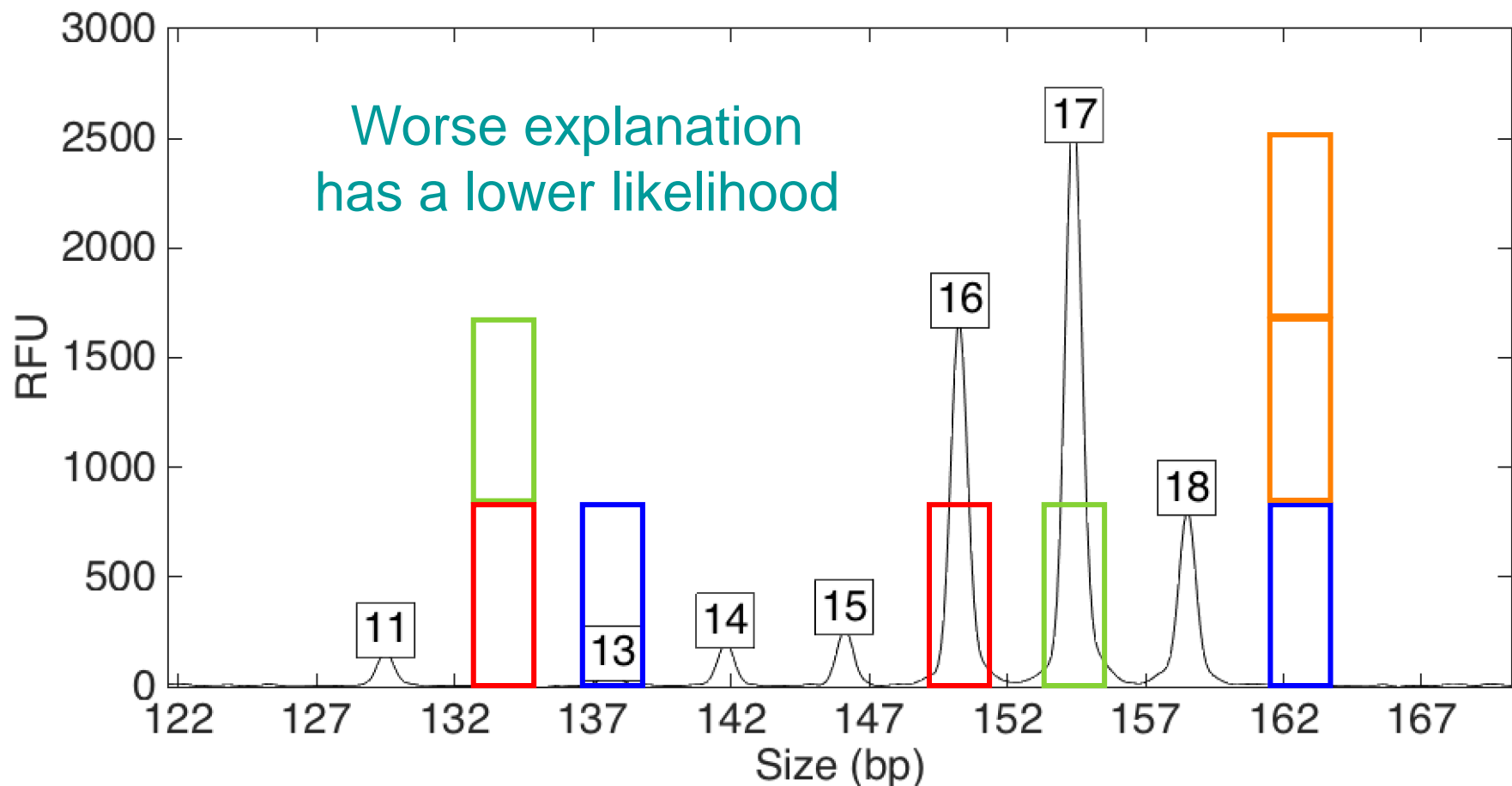
How the computer thinks

Consider every possible genotype solution



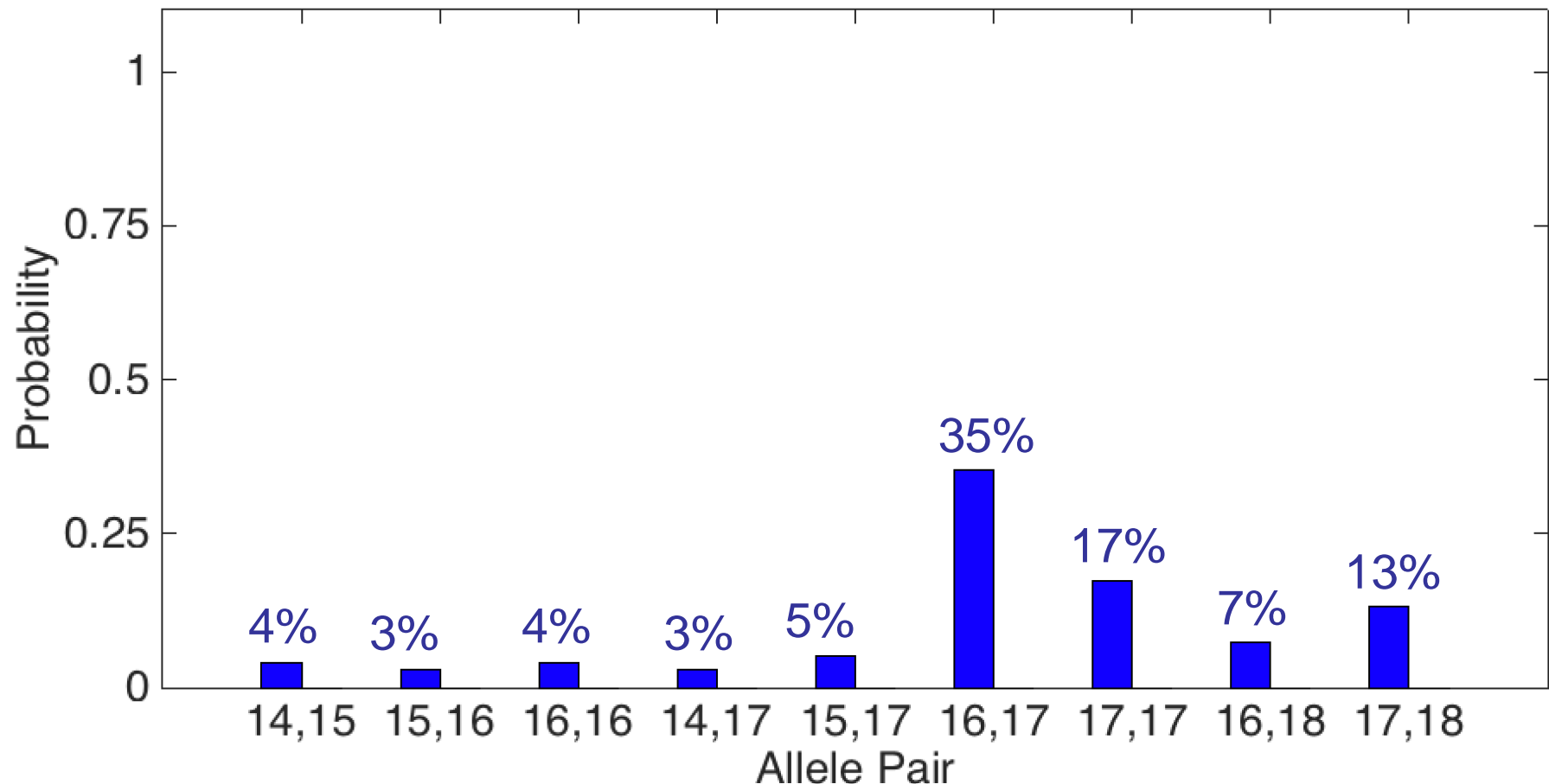
How the computer thinks

Consider every possible genotype solution



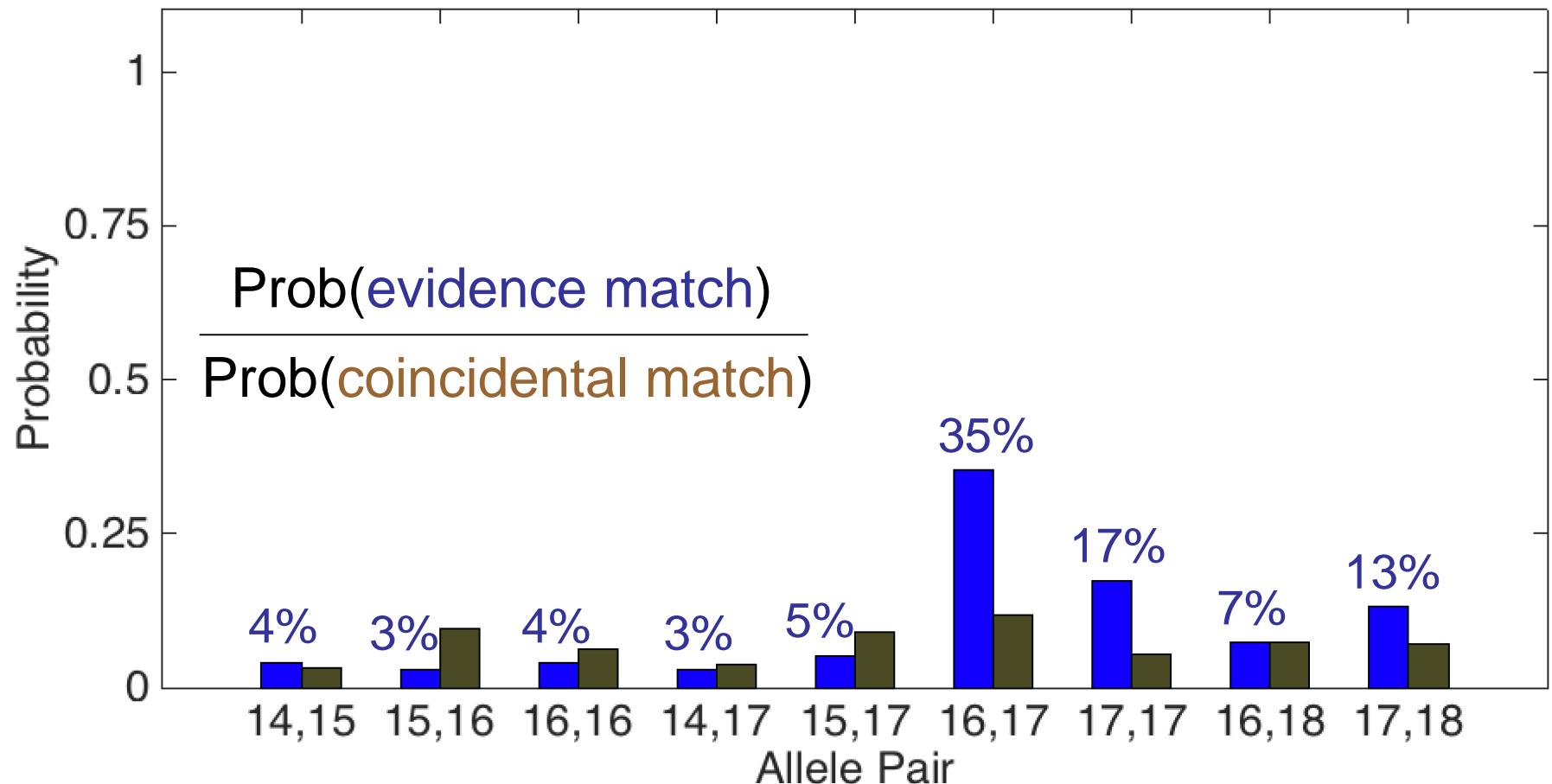
Evidence genotype

Objective genotype determined solely from the DNA data.
Never sees a comparison reference.



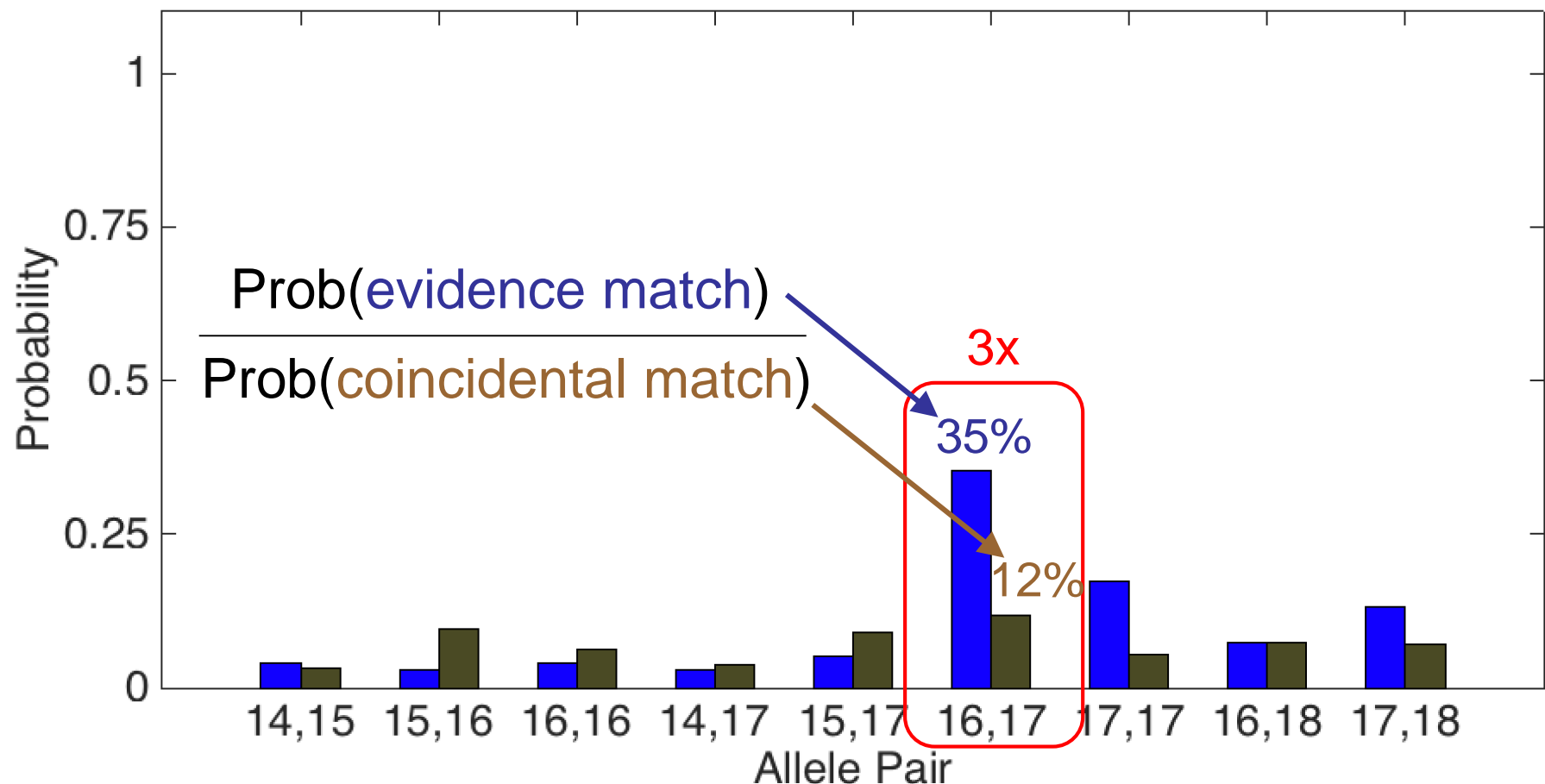
DNA match information

How much more does someone **match the evidence** than **a random person**?

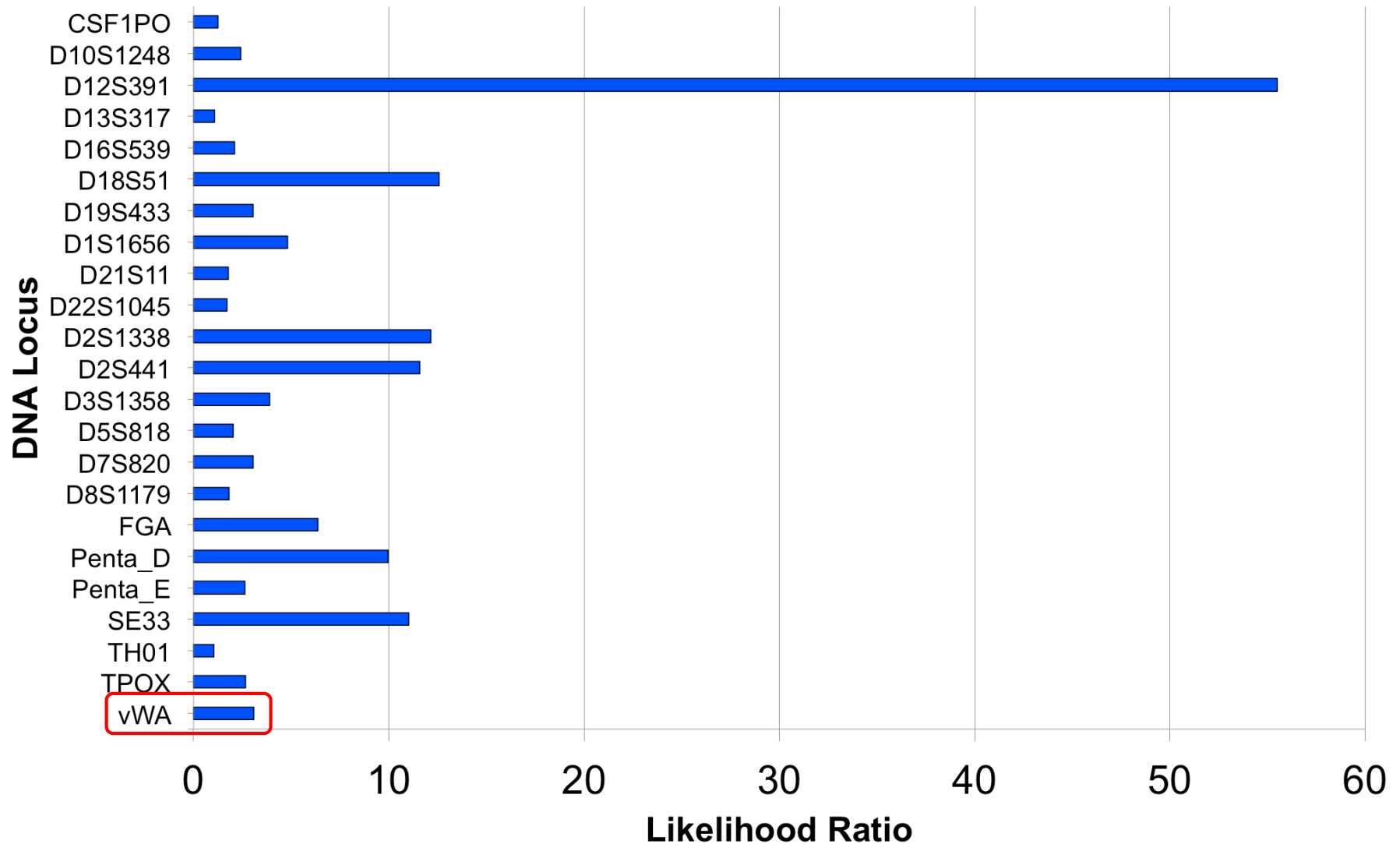


DNA match information

How much more does the **suspect match** the evidence than **a random person**?



Match information at 23 loci



Is the suspect in the evidence?

A match between the pistol
and Lafon Ellis is:

21.4 trillion times more probable than
a coincidental match to an unrelated African-American person

9.42 quadrillion times more probable than
a coincidental match to an unrelated Caucasian person

19.2 quadrillion times more probable than
a coincidental match to an unrelated Hispanic person

Match statistics

4

Item	Description	Lafon Ellis
2A	pistol	21.4 trillion

Match statistics

4

Item	Description	Lafon Ellis
2A	pistol	13.33